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Senior Division 1972

Ontario Department
of Education

Graphic Arts



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Inquiries pertaining to the preparation or implementation of courses within the scope of this document are invited.

Correspondence may be conducted with the Regional Director of Education located at the offices indicated on the following page, or with the Director of Curriculum, Ontario Department of Education, Queen's Park, Toronto.

Department of Education Regional Offices

Region	Address
Region 1, Northwestern	303 News Chronicle Building Station P Thunder Bay, Ontario
Region 2, Midnorthern	1349 Lasalle Blvd. Sudbury, Ontario
Region 3, Northeastern	240 Algonquin Avenue North Bay, Ontario
Region 4, Western	759 Hyde Park Road London 73, Ontario
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Region 8, East Central	Heron's Hill Building Suite 3201 2025 Sheppard Ave. East Willowdale 425, Ontario
Region 9, Eastern	1082 Princess Street Kingston, Ontario
Region 10, Ottawa Valley	1825 Woodward Drive Ottawa K2C 0R2, Ontario

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Foreword

The purpose of this curriculum guideline is to assist Graphic Arts teachers in their development of courses of study that meet the present and anticipate the future needs of their students. As such, this document replaces Graphic Arts for Grades 11 and 12 in Curriculum RP-27. It should be emphasized, however, that the content of this guideline is not mandatory; teachers may supplement it with additional material to whatever degree they wish.

Regardless of the content of courses, it is important that teachers adopt an approach that is technological in nature. There should be sufficient breadth to cover basic principles and provide insights into related areas. While every effort should be made to keep students aware of new developments in the industry, effective integration with other disciplines in the school is of equal importance. The relationships between Graphic Arts and Language Arts, Mathematics, Chemistry, and Commercial Art should be reinforced in every phase of any study, and the merits of being knowledgeable in both English and French should be stressed.

Although the material in this guideline is organized in a logical manner, no attempt has been made to divide it into lessons and no chronological sequence is implied. The actual designing of courses should be done by the teacher, with the assistance of students, other teachers, the principal, local school board staff, and Department of Education program consultants.

Among those students who choose to study Graphic Arts, there will be some who wish to examine it only in an exploratory way while others will want an in-depth treatment of the entire field. It is therefore the teacher's responsibility to determine the depth of coverage that will satisfy students with different needs and varying degrees of interest. The importance of judicious selection from the material provided as well as additional topics deemed appropriate by the teacher cannot be over-emphasized, for only by this means can a course of study be prepared that will reflect both balance and relevance at the same time.

It is recommended that practical work account for approximately sixty per cent of the student's time. This balance should provide for a wider range of learning experiences than might be achieved with more emphasis on a theoretical approach. At the same time, this percentage should demonstrate the necessity for the acquisition of theory which makes the practical more meaningful. Both in the theoretical and the practical activities, an individualized inductive approach should be employed.

The teachers of Graphic Arts should make full use of school projects as part of their programs, but should guard against a common pitfall: production demands should not force omission of other equally important aspects of a course.

Aims and Objectives

The aims and objectives of courses in Graphic Arts should reflect the varying interests and abilities of students. For some, the acquisition of both theoretical knowledge and manipulative skills, as well as an appreciation for the aesthetics in design should promote an understanding of graphics as an integral part of their total educational experience. For others, the course should facilitate direct employment in any one of the many diverse areas of the graphic arts field.

To achieve these aims and variations in objectives, teachers are encouraged to keep technology in mind and should consider the following in preparing courses for students of Graphic Arts.

A course in Graphic Arts should:

- stimulate the imagination and encourage a creative approach
- develop taste and a greater aesthetic sensitivity
- demonstrate and reinforce the relationships between Graphic Arts and other disciplines
- develop adaptability to cope with innovation and change
- encourage good work habits and co-operation through group activities
- develop a positive approach to learning for its own sake
- provide an overview of the industry and stimulate an interest in the entire field of communication arts
- develop in the student the ability to tackle problems logically, with confidence, and personal pride
- develop an awareness of potentially dangerous practices and emphasize the necessity of observing safety precautions both in and out of school
- provide an additional basis for employment and/or further formal education through the acquisition of a variety of related technical skills.

Safety

Wherever there are machines and materials, hidden hazards will invariably exist. Safety is everyone’s responsibility and safety consciousness is imperative in the Graphic Arts room.

While it is primarily the responsibility of the school board to ensure that the design and equipment of technical areas in the school are as safe as possible, it is the responsibility of the teacher and his immediate supervisor to see that safe working and teaching practices are observed.

Teachers of Graphic Arts have an excellent opportunity to condition their students in safety practices. A clear definition of possible dangers and potentially unsound procedures prior to any activity should encourage students to “think safety” at all times. Respect for machinery and an awareness of one’s own personal limitations can also contribute a great deal to an accident-free shop. Recognized industrial safety organizations can provide speakers, films, literature, and periodic inspections which help to reinforce this important aspect of the work.

Guideline Organization

Division 1: Generation of Image

Hot Metal Composition
Cold Composition
Photo Composition
Computerized Composition
Design and Layout

Division 2: Preparation of Image

Photography
Stripping
Proofing
Plate Preparation

Division 3: Reproduction of Image

Relief
Planographic
Intaglio
Screen Process
Pressureless
Materials
Finishing and Binding

Division 4: Printing Management

Production Planning and Control
Estimating
Industrial Relations
Overview of Industry
Historical Aspects

Division 1: Generation of Image

Hot Metal Composition

Cold Composition

Photo Composition

Computerized Composition

Design and Layout

Generation of image is a general term used to cover the many ways in which Graphic Arts creates images and generates alphabets into the printed word. With data processing and optical scanners contributing to a revolution in the setting of type, probably no other segment of industry is undergoing such variation and change. While the conventional hot metal method still remains a popular technique, students should become familiar with innovations in order to develop a healthy attitude to change.

Because of the general usefulness of *hot metal* methods in typesetting, coverage of this topic should include both hand and machine techniques. Types of tools, column make-up, and imposition lock-up, as well as the types of line and strip casting should be investigated. The need for care in spacing and the function of balance should be emphasized, and the importance of accurate spelling and proper syllabication should be stressed.

The wide use of hand paste-up and the popularity of strike-on and photolettering machines in *cold composition* work makes it an equally important area for the students' concern.

Photo composition should also be considered in any study to prepare the student for more recent changes in the industrial Graphic Arts field. A survey of the types and capabilities of various keyboards and photo units would be warranted, as well as an investigation of the set-up, operation, and maintenance of photo composition machines.

With the increasing emphasis on production and printing distribution techniques, reliance on *computerized composition* will continue to grow. Studies undertaken in this area should therefore investigate the

preparation of punched and magnetic tapes for driving mechanical, photomechanical, and electronic (CRT) imaging devices. Students should be made aware of the differences between the special-purpose computer, which hyphenates and justifies for typesetting, and the general-purpose computer, which may be programmed for many aspects of composition. Throughout this phase of a course, consideration should be given to the use of visual aids and lectures by qualified industrial personnel. Even though basic programming may be taught elsewhere in the school, visits to a computerized composition installation may still provide the best means to elaborate on this aspect of the course.

Design and layout, although presented as a separate heading here, should be considered as an integral part of Graphic Arts. While the concepts and fundamental principles of design are primarily directed to art, they are also basic to the whole printing industry and should be thoroughly investigated to promote a greater sense of appreciation for the aesthetic elements of the finished design.

The effects of various types of illustration should be emphasized, and the role of materials and colour in design explored. Balance, harmony, contrast, and proportion are all important aesthetic ingredients of package design and promotional material, and a commercial artist or package designer could contribute immeasurably to the students' appreciation of these aspects of design.

Proficiency in preliminary and comprehensive "thumbnail" sketches and layouts which project these fundamental concepts should be encouraged, as should the development of hand lettering and air-brush techniques.

Photography

Stripping

Proofing

Plate Preparation

The use of photography as a *preparation-of-image* technique has greatly increased in popularity over the past few years. With this change in emphasis from metal type to photographic media, the student should have every opportunity to make line negatives, halftones, and colour separations, as well as gain experience in the various correctional methods used.

Students of Graphic Arts should be familiar with the general construction of cameras as well as basic calibration techniques. Appropriate aperture settings, exposure times, illumination practices, and the application of various lenses and filters should also be stressed. With this experience added to a knowledge of film emulsions and processing practices, students should be capable of producing negatives acceptable for projects under way. Exposure calculations and tonal evaluations for halftone and colour copy should also be undertaken, and the use of comparators as a means of quality control is warranted in all colour separation work. The practice of keeping written records of exposures and the results obtained should be encouraged, as this is an important aspect in photographic work.

Since neat, accurate, and correctly imposed images, achieved by accepted techniques, constitute an important factor in image preparation, both negative and positive *stripping* procedures should receive due emphasis in any Graphic Arts course. Proper care and use of layout and measuring

tools is essential, and the need for accuracy in the positioning of all flats should be stressed. The ability to convert fractions into decimals is important in the preparation of step and repeat charts.

Because accuracy in printed material is paramount in any design, study of *proofing* should give both proof-types and proof-reading methods the emphasis they justly deserve. Press, photo, and mechanical types should all receive due consideration, and the use of standardized proof-reading marks should be employed. The importance of correct spelling and proper grammatical form cannot be overemphasized in this and other aspects of the course.

A study of *plate preparation* should include both relief and planographic techniques. Original and duplicate relief plates should be examined and their study should include types, methods of manufacture, materials, and the chemistry involved. The opportunity to become familiar with the handling, exposing, processing, and storing of such planographic media as direct image, whirler type and wipe-on, pre-sensitized, surface and deep-etch plates should be provided. The relationships among intensity of light, distance of travel, and the sensitivity of various plate emulsions should also be explored. However, while it is important that existing plate-making methods be thoroughly appreciated, teachers are encouraged to introduce new synthetic materials and new manufacturing processes at appropriate times.

Relief
Planographic
Intaglio
Screen Process
Pressureless
Materials
Finishing and Binding

In this division, the popular modes used to reproduce the image could be expanded in considerable detail. While presses and other reproduction devices fall into many categories, the main emphasis during this part of the study should be on the set-up, make-ready, operation, maintenance, and limitations of the particular process involved.

While investigating the *relief* method of reproduction, the platen, cylinder, and rotary presses should be explored. As it is unlikely that many schools will have a web press, the use of audio-visual material and visits to local newspapers are encouraged to reinforce this aspect of the course.

In *planographic* printing, two-cylinder, three-cylinder, perfecting, and web presses should be considered. Comparisons between rotary and offset web presses are warranted and plant tours could prove worthwhile for the students involved. Since planographic printing is a chemical process, its study should also provide an excellent opportunity for correlation with the science department in the school.

Intaglio printing, which includes rotogravure, etchings, and engravings, as a vehicle of reproduction could be investigated from a comparison-of-results point of view. Both web-fed and sheet-fed press processes should be considered and the results compared with those obtained by other popular printing means.

Screen process should include the study of both stencil preparation and press applications. Hand-cut, photographic, and electronic stencils should be prepared by the students and they should have the opportunity to set up and print a screen process project.

Pressureless offset masters should also be considered so that students may be made aware of the scientific principles involved and the advantages and limitations of making copy by this means. They should have the opportunity to work with as many different kinds of pressureless masters as possible and to employ both electrostatic and scanning preparation techniques.

The study of *materials* should provide the student with an overall appreciation of the consumables used in the Graphic Arts field. Both offset and letterpress inks should be considered so that ingredients, inherent problems, and blending techniques to obtain secondary colours might be explored. A research assignment could compare resilient and non-resilient rollers used in printing and point out the advantages and disadvantages of each. Paper should also be considered, and this area of study should cover everything from its manufacture to the variety of surface-checking techniques. Tests for drying qualities and suitability of ink for various surfaces and presses should also be carried out, as should calculations for determining the number of pieces that could be cut from a given sheet.

In conjunction with the chemistry department in the school, consideration of the various types, properties, and applications of solvents and lubricants should provide some insight into flash point, evaporation, and the toxic qualities of solvents used in the Graphic Arts field. Charts on lubricants and films on safety procedures regarding solvents are highly recommended to reinforce this aspect of the course.

Finishing and binding as a facet of reproduction could be considered to include all of the work connected with the completion of a job. However, since they represent a multi-million-dollar segment of the industry and involve highly sophisticated machinery, displays and demonstrations may be the only means available to present many of the aspects involved. Teachers should, nevertheless, provide every opportunity for students to practise the jogging and trimming of stock and the proper handling, counting, and maintenance of the feed edges of paper. Binding might best be appreciated through an analysis of a case-bound book and the examination of covers, signatures, and signature markers and by comparing sewing and gluing techniques.

Production Planning and Control

Estimating

Industrial Relations

Overview of Industry

Historical Aspects

This division combines the content of all the previous divisions into the organization of the printing industry as a whole. Regardless of the degree of specialization that a student might choose, it is felt that he should have an overall appreciation of the various branches in the management of printing and the various levels within each branch.

An understanding of *production planning and control* will provide a valuable background for the student, regardless of his intentions on graduation. While its actual application will vary according to the production work undertaken in the shop, it should receive due emphasis in any course.

Plant capacity and in-plant scheduling are, of course, important factors in production planning and control. The variety of in-plant records should be considered since these determine the efficient flow of a production job. The need for following explicitly the written instructions of a job should be emphasized, and the function of time cards, time tickets, estimate forms, and purchase orders should be fully explored. Quality control is also an important aspect of production, and departmental responsibilities should be clearly defined.

Estimating is recognized in printing as the major ingredient contributing to the economic well-being of the organization. A good estimator sits at the nerve centre of the establishment and must be knowledgeable in all aspects of the trade.

The responsibility of the estimator to both the owner and the client should be considered, as should the various practices that he employs. Students could compare various copy-counting methods and copy-fitting techniques as well as types of composition, imposition and lock-up,

presswork, and finishing to give them a clear insight into how the estimator works and the relative costs that would be involved.

Industrial relations plays an increasingly important role in printing as it does in most industrial operations today. Exploration of this topic in conjunction with the history department of the school could provide the student with an insight into the growth of the labour movement in general and its present influence in the Graphic Arts field. In collaboration with the Ontario Department of Labour and local trade union centres, apprenticeship practices could be thoroughly investigated and all aspects of contracts and employer/employee responsibilities explored.

In the *Overview of industry*, students should have the opportunity to analyse all facets of administration within the trade. Representatives from the Junior Board of Trade could provide information on the various levels and functions of management, and sales and advertising personnel could be invited to expand on product-promotion techniques. All levels play their separate and distinct roles within the organization and each should be introduced at appropriate times in the course.

Historical aspects is a sub-heading of Printing Management, for good management should inculcate an appreciation of the historical past of printing. The advances over time in the basic visual form, the alphabet, should therefore be investigated, as should progress in the printed visual form, materials, inks, image sources, and reproduction processes. Through comparative studies, this should lead to a better appreciation of present technological advances and meaningful discussions regarding future prospects within the whole Graphic Arts field.

Implementation

A complete course as suggested in this guideline could be implemented over a two-year period in approximately 660 hours of student time. This would meet the needs of both those students who intend to seek employment in the field upon graduation and those who wish to proceed to a college of applied arts and technology for further study in Graphic Arts.

The guideline material, furthermore, is also adaptable to the needs of students who have other aspirations. The chart indicates *some* of the possibilities but additional courses are possible. Should local administrators decide to offer other combinations, the courses should be defined on the basis of individual student needs.

Possible courses	Content	Teachers required	Possible credits
Graphic Arts A specialized course for the student who wishes an in-depth study of the over-all practices and principles in Graphic Arts. The graduate may proceed to tertiary education or seek employment in any one of the printing fields.	Divisions 1, 2, 3, 4	One or Two	6 credits over a two-year period
Design and Layout A course designed to develop an appreciation for good design through a study of design and various layout techniques.	Part of Division 1	One	1 credit over a one-year period
Printing Management A general course for the student who wants an over-all understanding of the responsibilities of management as it relates specifically to the printing industry.	Division 4	One	2 credits over a one-year period
The History of Graphics This course would be beneficial for a student who wishes to gain some insight into the development of graphic arts as an integral part of his general education.	Part of Division 4	One	½ credit over a one-year period

Resource Material

Books

Arnold, Edmund C. *Modern Newspaper Design*. New York: Harper & Row, 1969. (Toronto: Fitzhenry & Whiteside Ltd.)

This book tells the story of changing newspaper production techniques.

Berry, W. J., Johnson, A. F., and Jaspert, W. P. *Encyclopaedia of Type Faces*. London: Blandford Press, 1970. (Toronto: The Copp Clark Publishing Company.)

This standard reference text covers British, European, and American type faces. Some 1,500 selections are illustrated, many as complete alphabets. They include faces likely to be of practical service, as well as those of historical importance.

Bureau, William H. *Paper from Pulp to Printing*. Chicago: Graphic Arts Publishing Co., 1968.

This complete, detailed account of the manufacturing process of paper explains usage, treatment, advantages, and disadvantages of using certain stocks for particular applications.

Cleaton, G. U., and Pitkin, C. W. *General Printing*. Bloomington, Ill.: McKnight & McKnight, 1963. (Toronto: Van Nostrand Reinhold Ltd.)

The beginner will benefit from this basic introductory text to Graphic Arts. It deals mainly with letterpress printing.

Cogoli, John. *Photo-Offset Fundamentals*. Bloomington, Ill.: McKnight & McKnight, 1967. (Toronto: Van Nostrand Reinhold Ltd.)

This text would be helpful in the study of basic photo-offset lithography. It is written in a simple style suitable for the beginner, and questions are included at the end of each chapter.

Dair, Carl. *Design with Type*. Toronto: University of Toronto Press, 1967.

A Canadian classic and a standard reference on sound typography, this book provides a logical step-by-step approach to help the reader understand typography and design.

Jayne, John J. *Small Printing Plant Management*. Chicago: Graphic Arts Publishing Company, 1965.

This book treats such subjects as production, estimating, selling, inventory control, and overtime as they apply to a small printing firm.

Karch, R. Randolph, and Buber, Edward J. *Graphic Arts Procedures: Offset Processes, Strike-on and Film Composition*. Toronto: General Publishing Co. Ltd., 1967.

This book covers the offset processes in a general way. There are questions at the end of each chapter, with answers in the back of the book. A study guide for teachers is available.

Mills, G. J. *Platen Press Operation*. Pittsburgh: G. J. Mills, 4136 Bigelow Boulevard, 1956.

This text covers in detail the operation of platen presses made by Chandler and Price, Kluge, and Heidelberg. It also includes chapters on imposition, lock-up, make-ready, hand-feeding, printing papers, platen press inks, and original and duplicate plates. The chapter covering

forms requiring special attention is particularly useful to the student pressman. Halftone illustrations are generously distributed throughout the text.

Paschel, Herbert D. *The First Book of Colour*. New York: Franklin Watts, 1959. (Toronto: Grolier of Canada.)

This text is a primer on colour and would be useful for courses in colour reproduction.

Silver, Gerald A. *Modern Graphic Arts Paste-up*. Toronto: General Publishing Co. Ltd., 1966.

This is a suitable book for introducing students to the preparation of copy for camera. It contains instructions and printed material for a series of paste-up assignments.

Strauss, Victor. *Printing Industry: An Introduction to Its Many Branches, Processes & Products*. New York: R. R. Bowker Co., 1967.

This profusely illustrated text provides a comprehensive study of the entire graphic arts industry.

Vagheney, Edward R. *Robertson Photo-Mechanix: In Focus*. Des Plaines, Illinois: Robertson Photo-Mechanix Inc., 1967.

This is an introduction to graphics with concentration on process photography.

Magazines

British Printer (monthly). 30 Old Burlington St., London W.1, England (Toronto: Maclean-Hunter Publishing Co. Ltd., Box 100).

♣ *Canadian Printer and Publisher* (monthly). Maclean-Hunter Publishing Co. Ltd., Box 100, Toronto.

♣ *Inland Printer/American Lithographer* (monthly). Maclean-Hunter Publishing Co. Ltd., Box 100, Toronto.

♣ Wells, David. *Printing Review* (quarterly). Jonathan Publications Ltd., 146 Bates Rd., Montreal 256, P.Q.

Graphic Arts Monthly. Graphic Publishing Co., 7373 North Lincoln Ave., Chicago, Ill.

Periodicals

Graphic Arts Technical Foundation (series of paperbacks and audio-visual materials.) Rochester Institute of Technology, 4615 Forbes Ave., Pittsburgh, Penn.

These cover many specific areas including halftone photography, stripping, and chemistry and physics of lithography. An excellent set of books for those studying lithography in depth or for a reference library.

Guide to Films, Periodicals and Books on Printing, Paper Publishing, Printed Advertising and Their Closely Related Industries. Compiled by G. J. Mills. Carnegie Press, Carnegie-Mellon University, Pittsburgh, Penn.

This compilation of motion pictures, filmstrips, periodicals, and books is available to Graphic Arts teachers.

Kodak AV Programs for Professional, Commercial and Industrial Use. Canadian Kodak Co. Ltd., 3500 Eglinton Ave. W., Toronto.

This booklet gives a brief description of films, filmstrips, and slides available from Canadian Kodak. Included are instructions for suggested use of the material, as well as for the ordering and returning of audio-visual programs.

Penrose Annual. Edited by Herbert Spencer. Percy Lund, Humphries & Co. Ltd., London, England.

This yearly review of the Graphic Arts features essays and papers on current trends by international authorities.

Sources of Information in the American Graphic Arts. Compiled by G. J. Mills. Carnegie Press, Carnegie-Mellon University, Pittsburgh, Penn.

This comprehensive catalogue, periodically revised, of bibliographies of books, periodicals, and directories covers Graphic Arts in North America. It also includes a section covering libraries, schools, trade associations, labour organizations, and research programs related to the field.

